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(54) Safety vacuum syringe for blood sampling

(57) A safety vacuum syringe for blood sampling, which includes a barrel (1), a cylindrical vacuum container (2) mounted inside the barrel, a hollow inner cap (3) mounted in the barrel at the front end, a hollow cylindrical connecting member (25) fixedly secured to the front end of the cylindrical vacuum container, a needle holder (6) having an outer needle cannula (65) and an inner needle cannula (66) at two opposite ends, an outer needle cap (5) covered on the outer needle cannula, and an outer bottom cap (7) fastened to the barrel to hold the vacuum container on the inside. When the vacuum container (2) is pulled out of the barrel (1) and detached from it, the connecting member (25) and the needle holder (6) are pulled to the inside of the barrel, the outer needle cap (5) and the outer bottom cap (7) are respectively and invertedly inserted into the two opposite ends of the barrel to deform the needle cannulas of the needle holder.

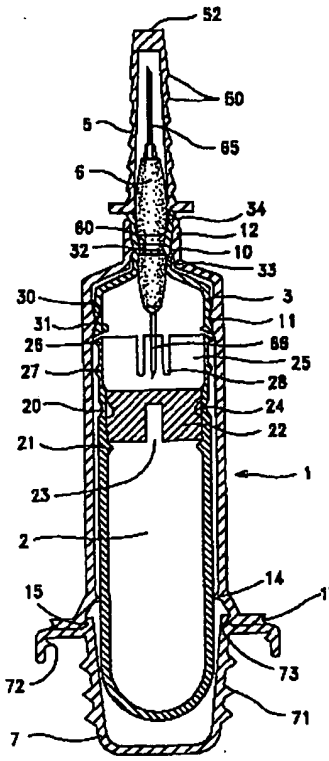

FIG. 1

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Description

BACKGROUND OF THE INVENTION

The present invention relates to vacuum syringes for blood sampling, and relates more particularly to such a safety vacuum syringe in which the needle holder with the two opposite needle cannulas are pulled to the inside of the barrel after the sampling of blood so that the needle cannulas are deformed when the outer needle cap and the outer bottom cap are respectively and invertedly inserted into the two opposite ends of the barrel.

In order to prevent contamination after the use of disposable hypodermic syringes, used disposable hypodermic syringes must be properly disposed of. Various safety hypodermic syringes have been disclosed, and have appeared on the market. Exemplars of these safety hypodermic syringes are seen in Taiwan patent utility model No.84873; U.S. Pat. No. 5,328,475. These safety hypodermic syringes permit the needle holder with the needle cannula to be pulled to the inside of the barrel and then deformed. However, even the needle cannula is deformed, it still will slip to the outside of the barrel when the barrel is oscillated or broken. Further, the safety designs of conventional safety hypodermic syringes are not applicable for the production of vacuum syringes for blood sampling because regular vacuum syringes commonly have a double-needle structure, i.e., the needle holder holds an outer needle cannula on the outside for insertion into the blood vessel, and an inner needle cannula on the inside for insertion into the vacuum chamber of the vacuum container.

SUMMARY OF THE INVENTION

The present invention has been accomplished under the circumstances in view. It is one object of the present invention to provide a safety vacuum syringe for blood sampling which permits the needle holder with the outer needle cannula and the inner needle cannula to be pulled to the inside of the barrel after the use of the vacuum syringe. It is another object of the present invention to provide a safety vacuum syringe for blood sampling which permits the outer needle cap and the outer bottom cap to be respectively detached from the barrel and then invertedly inserted into the two opposite ends of the barrel to collapse the outer needle cannula and the inner needle cannula. It is still another object of the present invention to provide a safety vacuum syringe for blood sampling which permits the outer needle cap and the outer bottom cap to be respectively and invertedly inserted into the two opposite ends of the barrel to reinforce the strength of the barrel and to protect it against outside pressure after the use of the safety vacuum syringe. It is still another object of the present invention to provide a safety vacuum syringe for blood sampling which permits the outer needle cap and the outer bottom cap to be respectively fastened to the two opposite ends of the barrel so that the safety vacuum syringe can be conveniently disposed of after its use.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of a safety vacuum syringe for blood sampling according to the present invention;

Fig. 2 is a perspective view of a hollow cylindrical connecting member according to the present invention;

Fig. 3 shows the outer needle cap and the outer bottom cap respectively removed from the needle holder and the barrel, and blood drawn into the cylindrical vacuum container according to the present invention;

Fig. 4 shows the connecting member with the cylindrical vacuum container pulled backwards, and the outside top flange of the connecting member engaged with the inward bottom flange of the inner cap according to the present invention;

Fig. 5 shows the cylindrical vacuum container disconnected from the connecting member according to the present invention; and

Fig. 6 shows the outer needle cap and the outer bottom cap respectively fastened to the two opposite ends of the barrel, and the needle cannulas deformed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figure 1, the cylindrical vacuum container, referenced by 2, has an inside annular flange 21 raised around the inside wall at a suitable location. A rubber stopper 22 is mounted inside the cylindrical vacuum container 2 and stopped at the inside annular flange 21 to keep the inside of the cylindrical vacuum container 2 in a vacuum condition. The rubber stopper 22 is made of cylindrical shape having a rounded blind hole 23 at the center of the bottom side, which diminishes the thickness of the center area of the rubber stopper 22 so that the inner needle cannula 66 of hollow needle holder, referenced by 6, can be easily inserted through the rubber stopper 22 into the inside vacuum space of the cylindrical vacuum container 2. The cylindrical vacuum container 2 has a neck 20 in front of the inside annular flange 21. When blood sample is collected, the cylindrical vacuum container 2 can be broken easily at the neck 20 and then removed from the barrel, referenced by 1. The rubber stopper 22 has an outside annular groove 24 around the periphery corresponding to the neck 20 of the cylindrical vacuum container 2. When the cylindrical vacuum container 2 is broken at the neck and removed from the barrel 1, the rubber stopper 22 is still retained to the detached cylindrical vacuum container 2 to seal sampled blood on the

inside. However, the rubber stopper 22 can be easily removed from the detached cylindrical vacuum container 2 through the outside annular groove 24, permitting sampled blood to be poured into a test tube for examination.

Referring to Figure 2 and Figure 1 again, a hollow cylindrical connecting member 25 is connected to the cylindrical vacuum container 2 and the rubber stopper 22 at the front side, having a plurality of longitudinal splits 28 extending to the front side, a downwardly sloping outside top flange 26 raised around the periphery of the top end, and an outside annular flange 27 raised around the periphery in the middle. The longitudinal splits 28 enable the hollow cylindrical connecting member 25 to be compressed inwards and forced into the inside of an inner cap 3 when the cylindrical vacuum container 2 is pushed forwards in the barrel 1. The inner cap 3 has an outside annular groove 30, an inward bottom flange 31 raised around the periphery of the bottom end and sloping upwardly inwards, a first inside annular flange 32, an outside annular flange 33, and a second inside annular flange 34. By engaging the outside annular groove 30 and the outside annular flange 33 with respective smoothly curved inside annular flanges 11, 10 of the barrel 1, the inner cap 3 is firmly retained to the front end of the barrel 1 on the inside. The inside annular flange 10 is flanged inside a sleeve portion 12 which protruded frontwardly from the barrel 1. The needle holder 6 is mounted in the inner cap 3, having an outside annular groove 60 around the periphery, which works with the first inside annular flange 32 and second inside annular flange 34 of the inner cap 3 for positioning. The aforesaid inner needle cannula 66 is connected to the needle holder 6 at one end and suspending in the hollow cylindrical connecting member 25. An outer needle cannula 65 is connected to the hollow needle holder 6 at an opposite end and projecting out of the inner cap 3. An outer needle cap 5 is detachably fastened to the needle holder 6 outside the barrel 1 and the inner cap 3 and covered over the outer needle cannula 65, having a plurality of outside annular grooves 50 around the periphery at different elevations, and a top head 52. The top head 52 can be serrated, or made of flat shape of certain thickness as shown in Fig. 1 and Fig. 6. The outer bottom cap 7 is flanged cap fastened to the bottom end of the barrel 1 to hold the cylindrical vacuum container 2 on the inside, having an outside annular groove 73 engaged with the inside projecting portion 15 of the outward bottom flange 17 of the barrel 1.

Referring to Figure 3 and Figure 1 again, when to collect blood sample, the outer needle cap 50 and the outer bottom cap 7 are respectively removed from the needle holder 6 and the barrel 1, then the outer needle cannula 65 is inserted into the patient's blood vessel, and then the cylindrical vacuum container 2 is pushed forwards in the barrel 1, When the cylindrical vacuum container 2 is pushed forwards in the barrel 1, the outside top flange 26 is compressed inwards by the inward bottom flange 31 and forced into the inside of the inner cap 3, causing the inner needle cannula 66 to pierce the rubber stopper 22 and to enter the inside of the cylindrical vacuum container 2. When the inner needle cannula 66 passes to the inside of the cylindrical vacuum container 2, blood B is sucked from the blood vessel into the cylindrical vacuum container 2 through the outer needle cannula 65 and the inner needle cannula 66.

Referring to Figure 4, when blood B is collected in the cylindrical vacuum container 2, the outer needle cannula 65 is removed from the blood vessel, then the cylindrical vacuum container 2 is pulled backwards. When the cylindrical vacuum container 2 is pulled backwards, the outside top flange 26 of the cylindrical vacuum container 2 will be stopped at the inward bottom flange 31 of the inner cap 3. When the outside top flange 26 of the cylindrical vacuum container 2 is stopped at the inward bottom flange 31 of the inner cap 3, the inner needle cannula 66 is disconnected from the rubber stopper 22. When keep pulling the cylindrical vacuum container 2 backwards, the outside annular groove 30 and outside annular flange 33 of the inner cap 3 will be disengaged from the smoothly curved inside annular flanges 11, 10 of the barrel 1, permitting the inner cap 3 with the needle holder 6 to be carried backwards by the cylindrical vacuum container 2. When the cylindrical vacuum container 2 is continuously pulled backwards, the outside annular flange 27 of the hollow cylindrical connecting member 25 will be stopped at the inside bottom flange 14 of the barrel 1.

Referring to Figure 5 and 6, when the cylindrical vacuum container 2 is pulled out of the barrel 1 and the outside annular flange 27 of the hollow cylindrical connecting member 25 is stopped at the inside bottom flange 14 of the barrel 1, the cylindrical vacuum container 2 is broken at the neck 20 by force. When the cylindrical vacuum container 2 is disconnected from the hollow cylindrical connecting member 25, the hollow cylindrical connecting member 25 with the inner cap 3 and the needle holder 6 are retained inside the barrel 1.

After the removal of the cylindrical vacuum container 2, the outer needle cap 5 is turned upside down, and the top head 52 is stopped against the outer needle cannula 65 and then forced into the front end of the barrel 1. When the top head 52 of the outer needle cap 5 is inserted into the front end of the barrel 1, the outside annular grooves 50 of the outer needle cap 5 are forced into engagement with the inside annular flange 10 of the barrel 1, and therefore the front end of the barrel 1 is stopped by the outer needle cap 5. Then the outer bottom cap 7 is invertedly inserted into the bottom end of the barrel 1. When the outer bottom cap 7 is invertedly inserted into the bottom end of the barrel 1, the plurality of outside annular flange 71, and the outside projecting portions 72 of the outer bottom cap 7 are respectively forced into engagement with the inside bottom flange 14 and outside bottom flange 17 of the barrel 1, and at the same time, the outer needle cannula 65 and inner nee-

dle cannula 66 are forced to deform between the outer needle cap 5 and the outer bottom cap 7. When the outer needle cap 5 and the outer bottom cap 7 are respectively inserted into two opposite ends of the barrel 1, they support the barrel 1 against outside pressure. Therefore, the barrel 1 will not be broken easily. Because the outer needle cap 5 and the outer bottom cap 7 are respectively fastened to the barrel 1 after the use of the vacuum syringe, the used vacuum syringe can be conveniently and safely disposed of. For the outer bottom cap 7 can securely fixed to the outward bottom flange 17 of the barrel 1, so the outer bottom cap 7 can be made of a plurality of the outside projecting portion 72 as shown in Fig. 6.

It is to be understood that the drawings are designed for purposes of illustration only, and are not intended as a definition of the limits and scope of the invention disclosed.

Claims

1. A safety vacuum syringe for blood sampling, comprising:

   a barrel having a reduced front end, a bottom end, an inside projection portion raised from said bottom end, and an inside bottom flange near said inward projecting portion;
   a cylindrical vacuum container mounted inside said barrel, said cylindrical vacuum container having a neck and a rubber stopper sealed at said neck;
   a hollow inner cap mounted in the front end of said barrel, said hollow inner cap having a bottom end and an inward bottom flange around the bottom end;
   a hollow cylindrical connecting member fixedly connected to one end of said cylindrical vacuum container outside said rubber stopper and disposed adjacent to said hollow inner cap, said hollow cylindrical connecting member having a plurality of longitudinal splits, an outside annular flange raise around the periphery in a middle of said hollow cylindrical connecting member, and an outside top flange raised round the periphery of a top end thereof;
   a hollow needle holder fastened to an inside of said hollow inner cap, having an outer needle cannula at an end disposed outside said barrel, and an inner needle cannula at an opposite end suspending in said hollow cylindrical connecting member;
   an outer needle cap covered on said hollow needle holder over said outer needle cannula; and
   an outer bottom cap fastened to the bottom end of said barrel to hold said cylindrical vacuum container inside said barrel, said outer bottom cap having an outside annular groove detachably engaged with the inside projecting portion of said barrel;

   wherein the outside top flange of said hollow cylindrical connecting member is forced into engagement with the inward bottom flange of said hollow inner cap when said cylindrical vacuum container is pushed forced and said inner needle cannula is forced to insert through said rubber stopper, permitting said hollow inner cap with said hollow needle holder to be pulled to the inside of said barrel when said vacuum container is pulled out of said barrel; the outside annular flange of said connecting member is engaged with the inside bottom flange of said barrel to stop said connecting member inside said barrel when said vacuum container is pulled out of said barrel and detached therefrom by breaking said neck, so that said outer needle cannula and said inner needle cannula are deformed when said outer needle cap and said outer bottom cap are invertedly and respectively inserted into the front and bottom ends of said barrel.

2. The safety vacuum syringe for blood sampling of claim 1 wherein said outer needle cap has a flat top head of fixed thickness for pushing the outer needle cannula backwards to the inside of said barrel.

3. The safety vacuum syringe for blood sampling of claim 1 wherein said outer needle cap has a serrated top head for pushing the outer needle cannula backwards to the inside of said barrel.

4. The safety vacuum syringe for blood sampling of claim 1 wherein said outer needle cap has a plurality of outside annular grooves, which are forced into engagement with an inside annular flange inside the reduced front end of said barrel to prevent disconnection of said outer needle cap from the reduced front end of said barrel after the insertion of said outer needle cap into the reduced front end of said barrel invertedly.

5. The safety vacuum syringe for blood sampling of claim 1 wherein said outer bottom cap has a plurality of outside annular flanges, which are forced into engagement with the inside bottom flange of said barrel to prevent disconnection of said outer bottom cap from the bottom end of said barrel after the insertion of said outer bottom cap into the bottom end of said barrel invertedly.

6. The safety vacuum syringe for blood sampling of claim 1 wherein said outer bottom cap has a plurality of outside projecting portion, which is forced into engagement with the inside projecting portion of

said barrel to prevent disconnection of said outer bottom cap from the bottom end of said barrel after the insertion of said outer bottom cap into the bottom end of said barrel invertedly.

7. The safety vacuum syringe for blood sampling of claim 1 wherein said said rubber stopper has an outside annular groove corresponding to the neck of said cylindrical vacuum container.

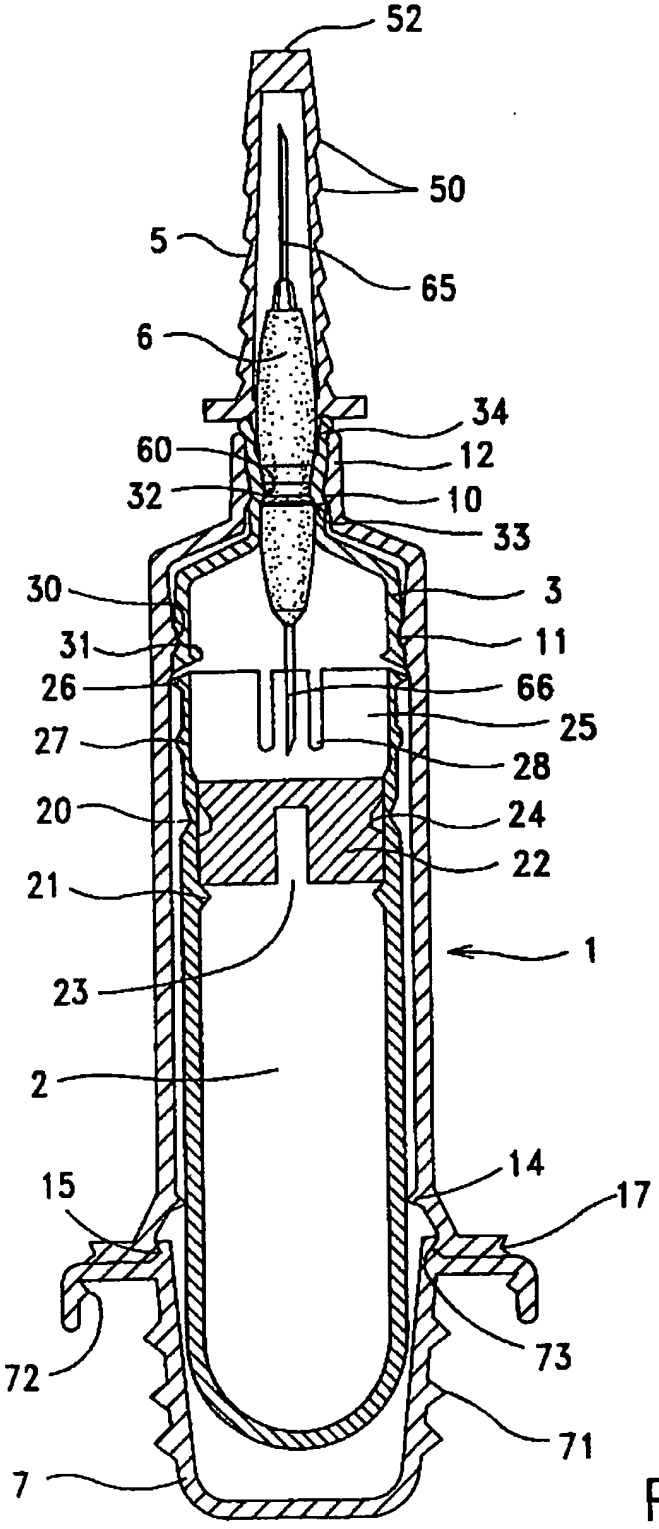
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FIG. 1

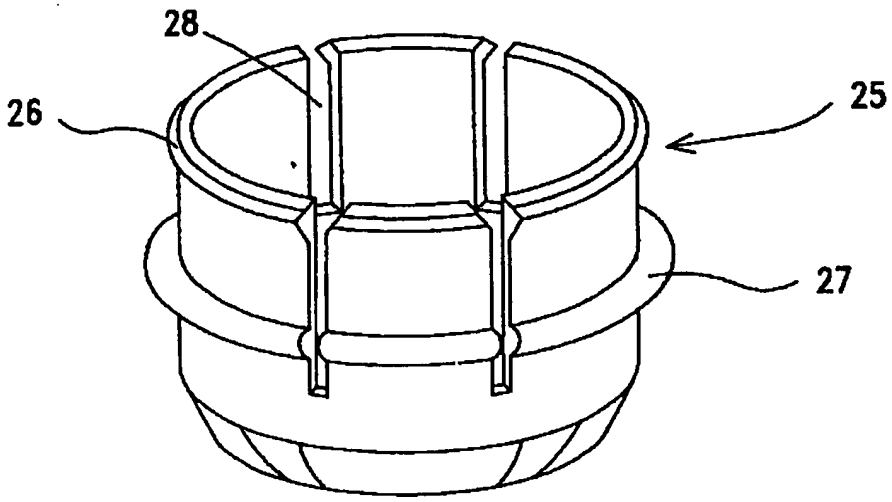

FIG.2

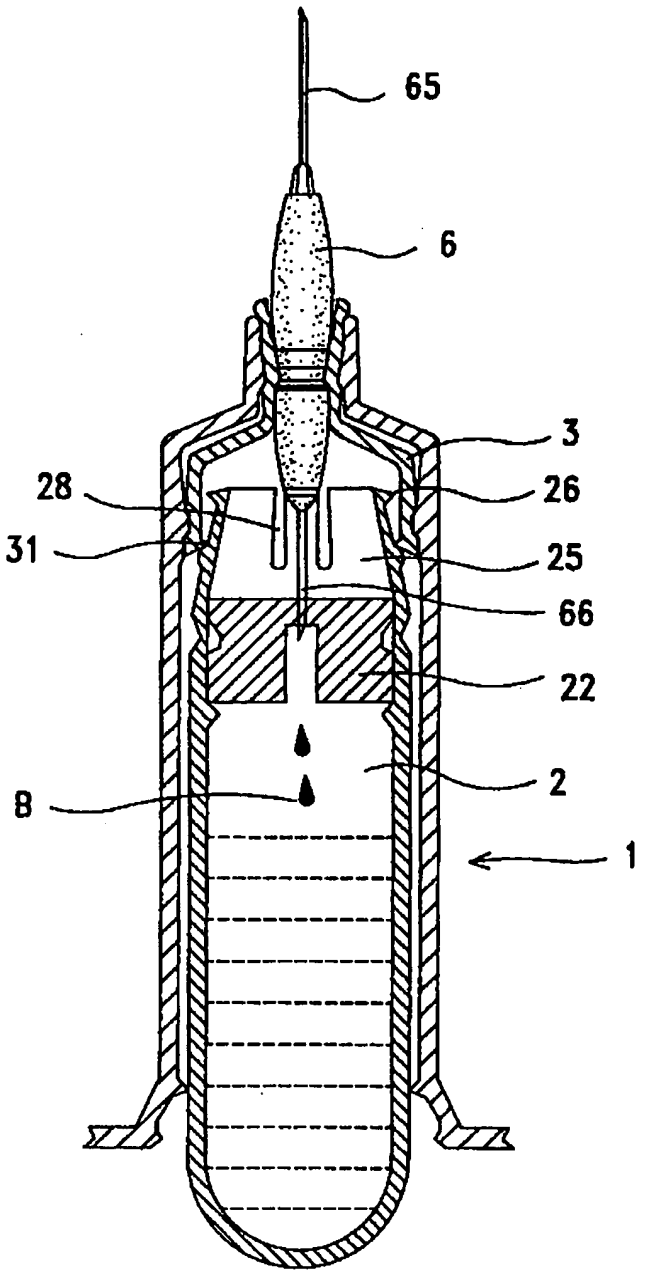

FIG.3

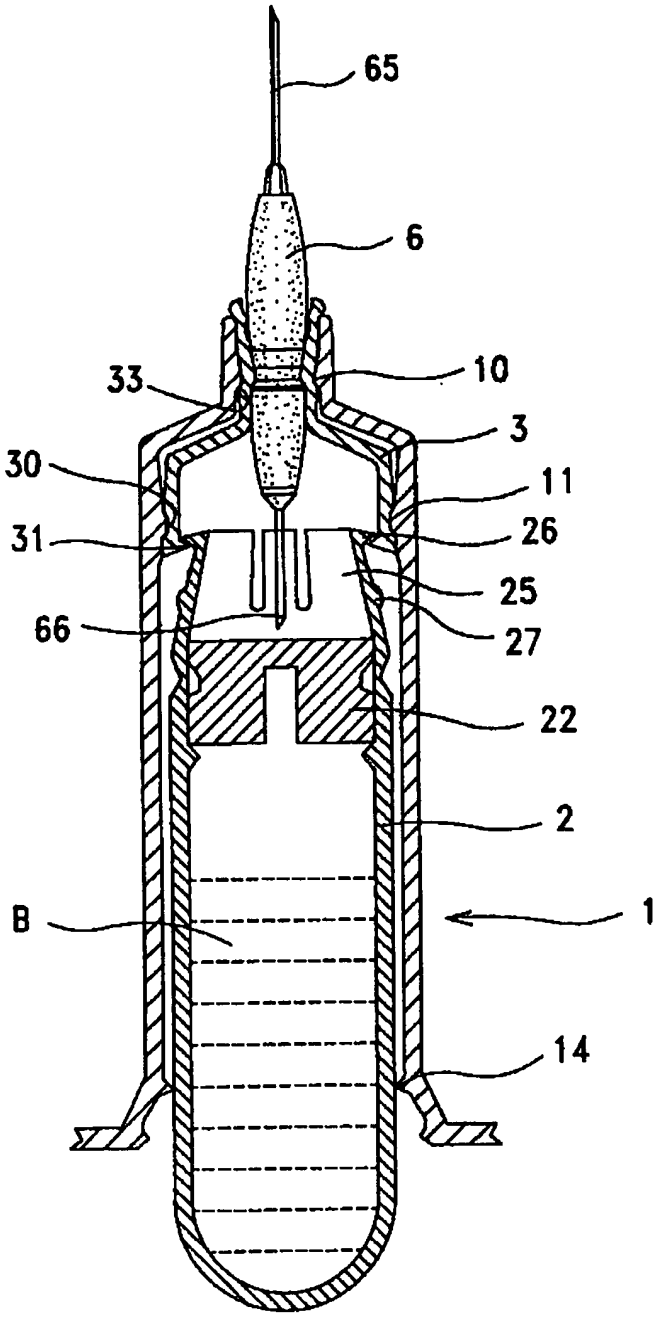

FIG.4

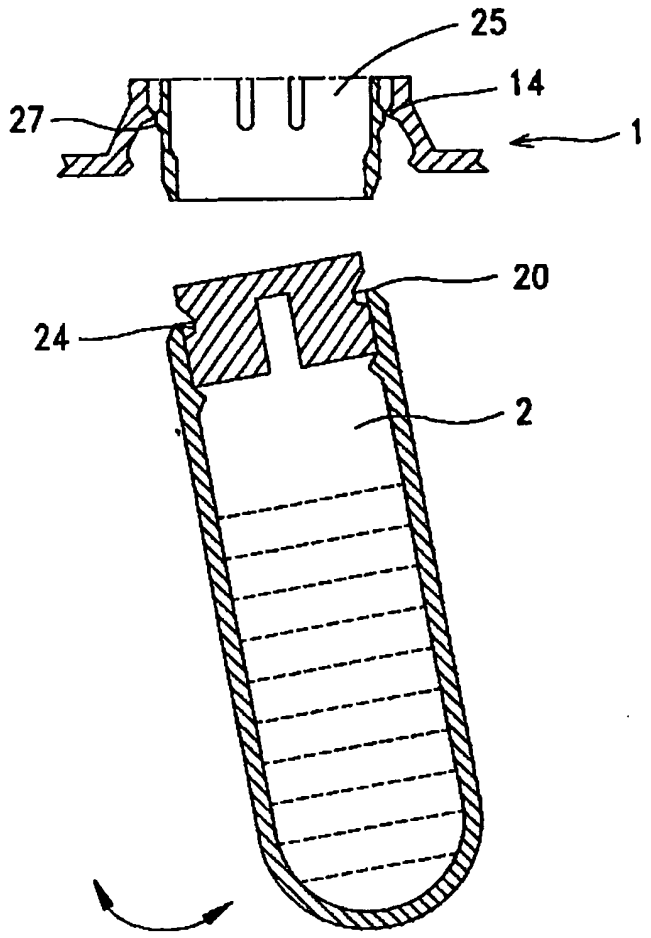

FIG.5

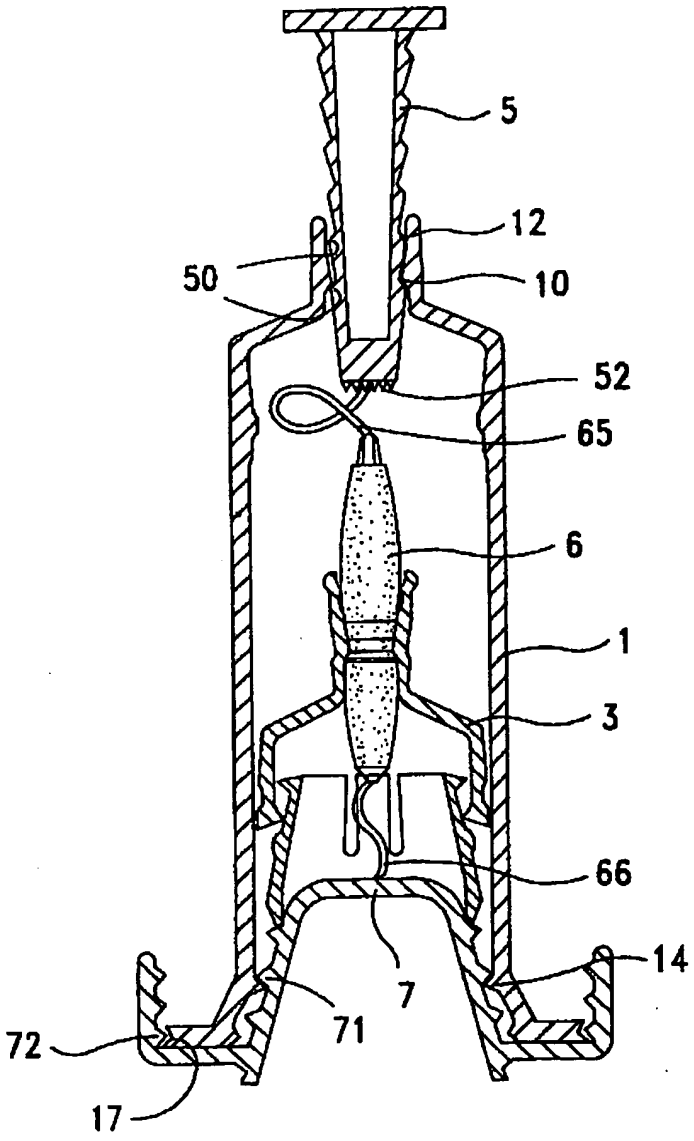

FIG.6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 30 6120

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 4 710 170 A (T.M. HABER ET AL.) * column 7, line 40 - column 9, line 20; figures 1-19 *	1	A61B5/14 A61M5/32
A	US 4 592 744 A (J.C. JAGGER ET AL.) * abstract; figures 4-6 *	1-6	
A	WO 92 05820 A (RETRAX INC.) * abstract; figures 1,2,8 *	1-4	
A	WO 90 11099 A (L.A. NOVACEK ET AL.) * abstract; figure 25 *	1	
A	GB 2 287 192 A (WAYMADE PLC) * abstract; figures 1-11 *	1	
A	DE 41 20 267 A (BADER & PARTNER MEDIZINTECHNIK GMBH) * abstract; figures 1-9 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A61B
A61M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 January 1997	Hunt, B

CATEGORY OF CITED DOCUMENTS

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